

Comparative Study Between Catalytic Converter And High Voltage Electrostatic Precipitator

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Abstract – A catalytic converter is a mechanical device utilized to reduce the harmful of exhaust from a various engine. This first frequently implemented on series-production automobiles in the various automobile market for the 1977 model year to comply with tightening EPA regulations on auto smoke, catalytic converters are still most popular smoke filter utilized in motor vehicle smoke systems. About 1950, when the results of studies was don on smog in Los Angeles were published, scientist Hurdy became famous about the role of automobile smoke in air pollution and open a special company Two-way catalytic converter is frequently utilized on diesel engines to reduce hydrocarbon and carbon monoxide emissions, and they were also utilized on spark ignition (gasoline) engines in automobile market automobiles through 1981, when the two-way converter's not efficient to control NOx led to its supersession by developing three-way converters.

Keywords- Filtration, Electrostatics, Power stroke, Exhaust, Volt.

INTRODUCTION

There are three-way catalytic converters can take oxygen from the smoke gas stream, usually when the air fuel ratio goes decreasing. When insufficient oxygen is available from the smoke stream the taken oxygen is released and consumed. This occurs either when oxygen derived from NOx reduction is insufficient or certain maneuvers such as hard acceleration enrich the mixture beyond the ability of the converter to compensate. Unnecessary reactions can happen in the three-way catalyst, such as the production of odiferous hydrogen sulfide and Ammonia. Production of each can be limited, By change to the wash coat and precious metals utilized. It is very hard to eliminate all these byproducts entirely the gap between columns (except 2-column illustrations may

cross the gap). For instance, when control of hydrogen sulfide exhausts desired, nickel or manganese is added to the wash coat. Both substances are block the adsorption of sulfur by the wash coat. Hydrogen sulfide is formed when the wash coat has adsorbed sulfur during a low temperature part of the operating cycle, which is then released during the high temperature part of the cycle and the sulfur combines with HC.

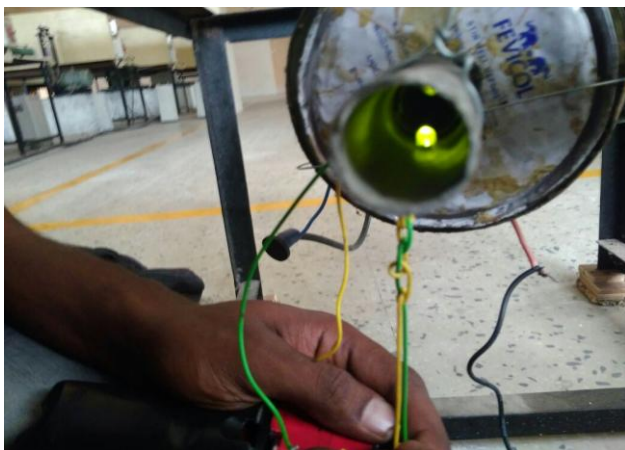


In the Electrostatic Precipitator every particle either has or can be given a charge - positive or negative. A high voltage system provides power to the discharge electrode to generate an electrical field. The particulate, entrained in the gas, is charged while passing through the electrical field. The particulate is then attracted to the grounded collector plate, and forms a dust layer on the plate. The positive ions move toward the negative discharge electrode (unlike charges attract). As the positive ions (positive gas molecules) are hundreds of times bigger than the tiny electrons, they move slowly, but they do pick up speed and many of them collide right into the metal

discharge electrode or the gas space around the wire causing additional electrons to be knocked off.

DETECTION METHOD

The smoke detection assembly is used in this method is based on the principle phenomenon of light. In this the photo-LED is used as source it is placed in the pipe shown in the following diagram. The same amount of light was falls on the photo-diode. There two steps in which reading is taken in the first step filter is not applied and in next step filter is applied reading was noted. In the first step the reading was found as with greater deflection it is due to the smoke present is not filtering up to mark by catalytic converter. In the second step deflection are found with less extended. The following figure shows the smoke detection assembly.



RESULT

When the velocity of smoke increases with the increase in the speed of the engine at that time the current in the spark is also increases and the filtration rated is also increases on other hand in catalytic converter the surface is constant. Therefore, the rate of filtration in the catalytic converter remains same. That drawback is mainly reduced in electrostatic precipitator technique. When the ambient temperature of the surrounding is increase at that instant, electrical resistance of precipitator plate of the filter increases slightly that leads in the power loss due this temperature.

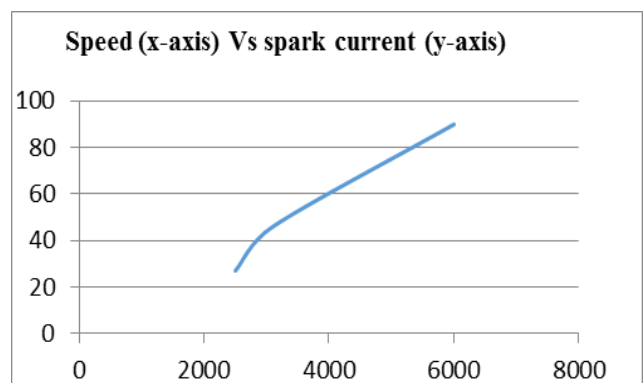
Table 1-When the filter is catalytic converter (In OFF Engine condition is 30mv)

Sr. No.	Speed of Engine (RPM)	Spark plug Current (Ampere)	Photodiode Voltage Variation (mv)
1	2500	27	23
2	3100	46	25
3	6000	90	27

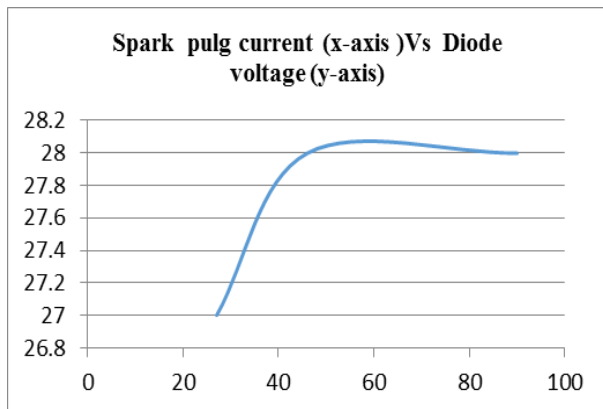
Table 2- When the filter are catalytic converter and electrostatic precipitator (In OFF Engine condition is 30mv)

Sr. No.	Speed of Engine (RPM)	Spark plug Current (Ampere)	Photodiode Voltage Variation (mv)
1	2500	27	27
2	3100	46	28
3	6000	90	28

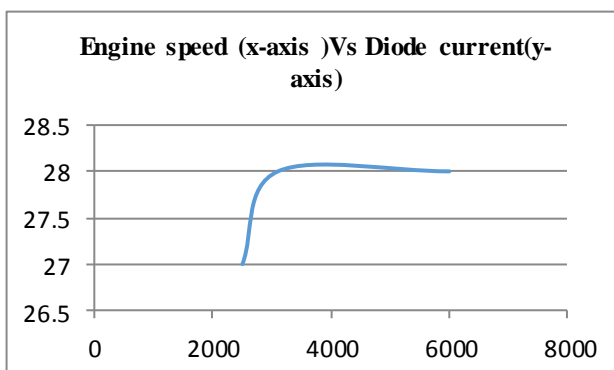
1) Engine speed Vs. Spark plug current characteristic



2) Spark plug current Vs. Diode current characteristic



3) Engine speed Vs. Diode voltage characteristics



CONCLUSION

The filter is based on the high voltage electrostatic phenomenon; efficiency is directly proportional applied voltage. The range of efficiency for the particle is in the 70% to 90% for PM1.0 particle and greater than 90% for the PM2.5 size particle.

In case of the catalytic converter the surface rates remains constant irrespective speed of vehicle.

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